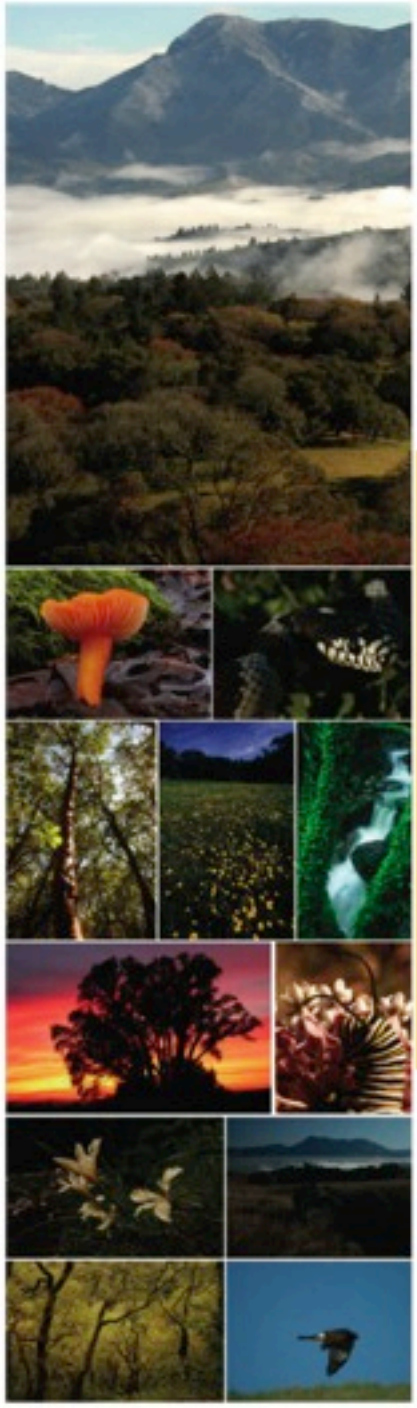

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The North (San Francisco) Bay Climate Adaptation Initiative: How can we build climate resilience into our communities at the county scale?

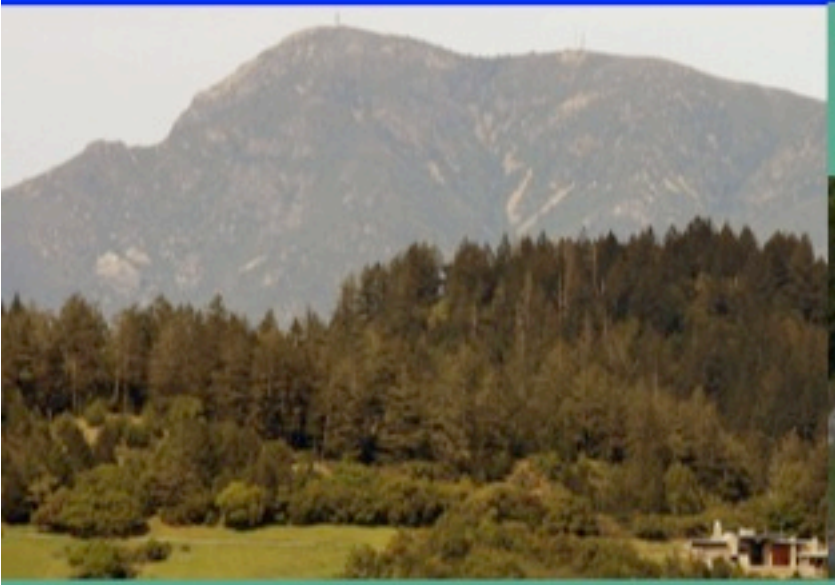
National Adaptation Forum, April 3, 2013

Dr. Lisa Micheli, Executive Director, Pepperwood
Co-chair NBCAI Science Working Group and TBC3

Pepperwood Foundation

mission

to advance science-based conservation throughout our region and beyond



The new Dwight Center for Conservation Science

3200-acre reserve in eastern Sonoma Co, originally gifted to CA Academy of Sciences

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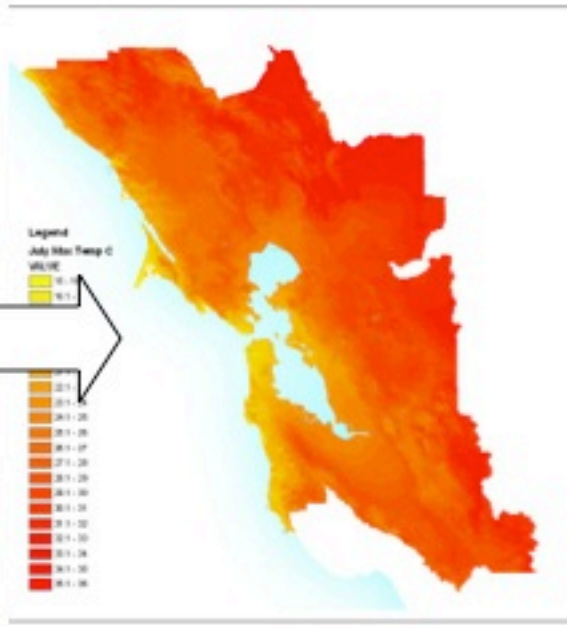
we explore



making the global local to learn how to cope with climate change

North Bay Climate Adaptation Initiative (NBCAI)

a coalition of natural resource managers, policy makers and scientists committed to working together to create positive solutions to the challenge of climate adaptation in Sonoma, Napa and Marin Counties.

northbayclimate.org

northbay CLIMATE ADAPTATION INITIATIVE

Coordinating Committee

David Bannister
Sierra Cantor
BC Capps
Caitlin Cornwall
Richard Dale
Deanne DiPietro
Robert Judd
Lisa Micheli
Genevieve Taylor

Sonoma State University Field Stations & Nature Preserves
Sonoma Land Trust
Laguna de Santa Rosa Foundation
Sonoma Ecology Center
Pepperwood Preserve
prbo
Sonoma County Agricultural Preservation and Open Space District
Sonoma County Water Agency
Community Foundation Sonoma County
San Francisco Bay Joint Venture
Climate Protection Campaign
State of California Coastal Conservancy
USGS science for a changing world
Creekside Center for Earth Observation
Prunuske Chatham, Inc.
Gold Ridge Resource Conservation District
California Environmental Protection Agency
North Coast Regional Water Quality Control Board

Terrestrial Biodiversity and Climate Change Collaborative (TBC3) focus on 9 bay area counties

an inter-disciplinary team focused on assessing climate-based risks and opportunities in management of the Bay Area conservation lands network

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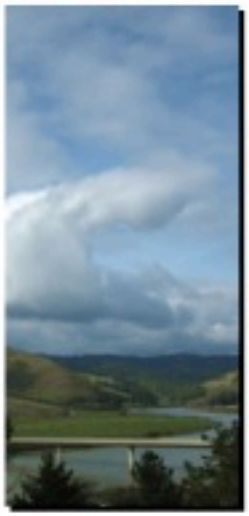
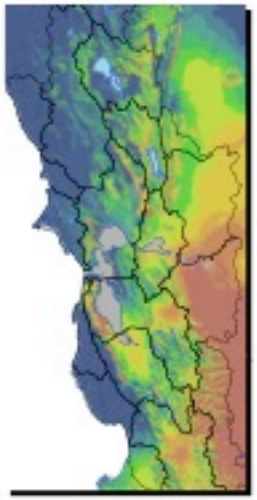
TBC3 Research Framework

Climate
+
Topography



Watershed
Hydrology
+
Topo-climate



Vegetation
Cover
+
Habitat
Structure

Species
Distributions

Metrics and indicators to be developed for each framework element

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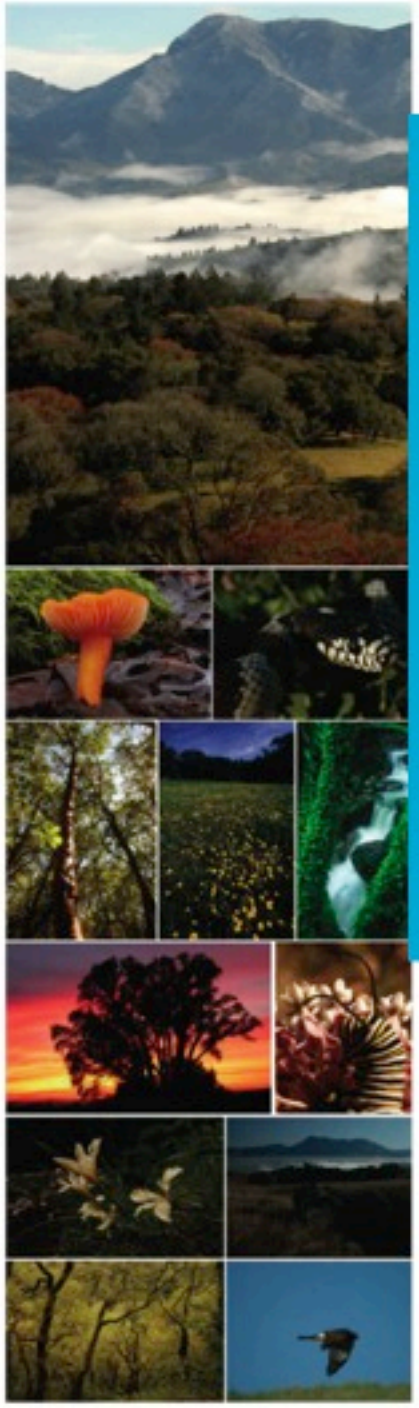

Why focus on climate adaptation at the scale of local decision-making?

North San Francisco Bay climate scenarios and vulnerabilities

Outreach goals for building community resilience

outline

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Why a county-scale approach to climate adaptation?

Because land and water management, infrastructure investments, open space protection, and emergency response in our region all lie in the hands of primarily county or municipal decision-makers and private landholders.

For example, over 85% of the land in Sonoma County is privately held.

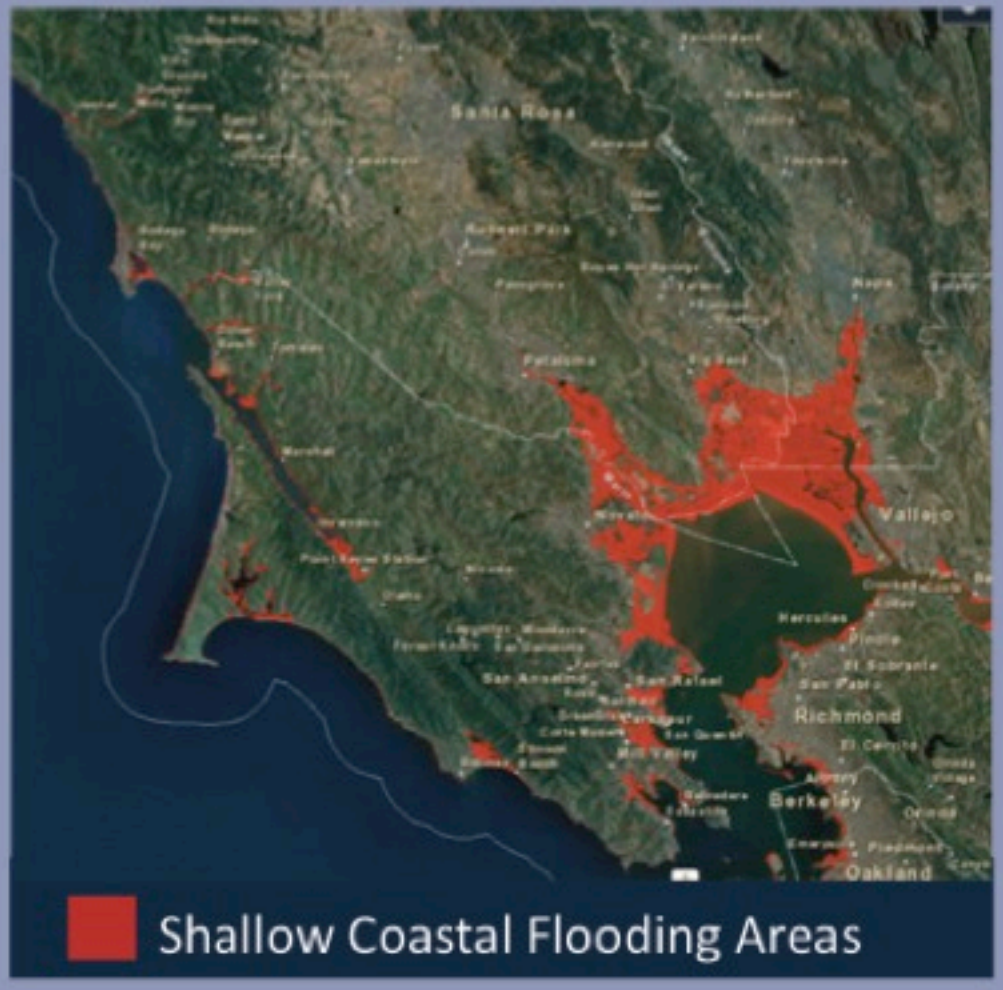
Scientists:
What do people need to know about climate change to plan effectively?

Our region is a leader in tackling climate mitigation and now adaptation

Managers:
What can the scientists tell us about climate vulnerability that we can use to do our jobs?

A dialog about what's important:
in CA water is important!

North Bay sea level rise



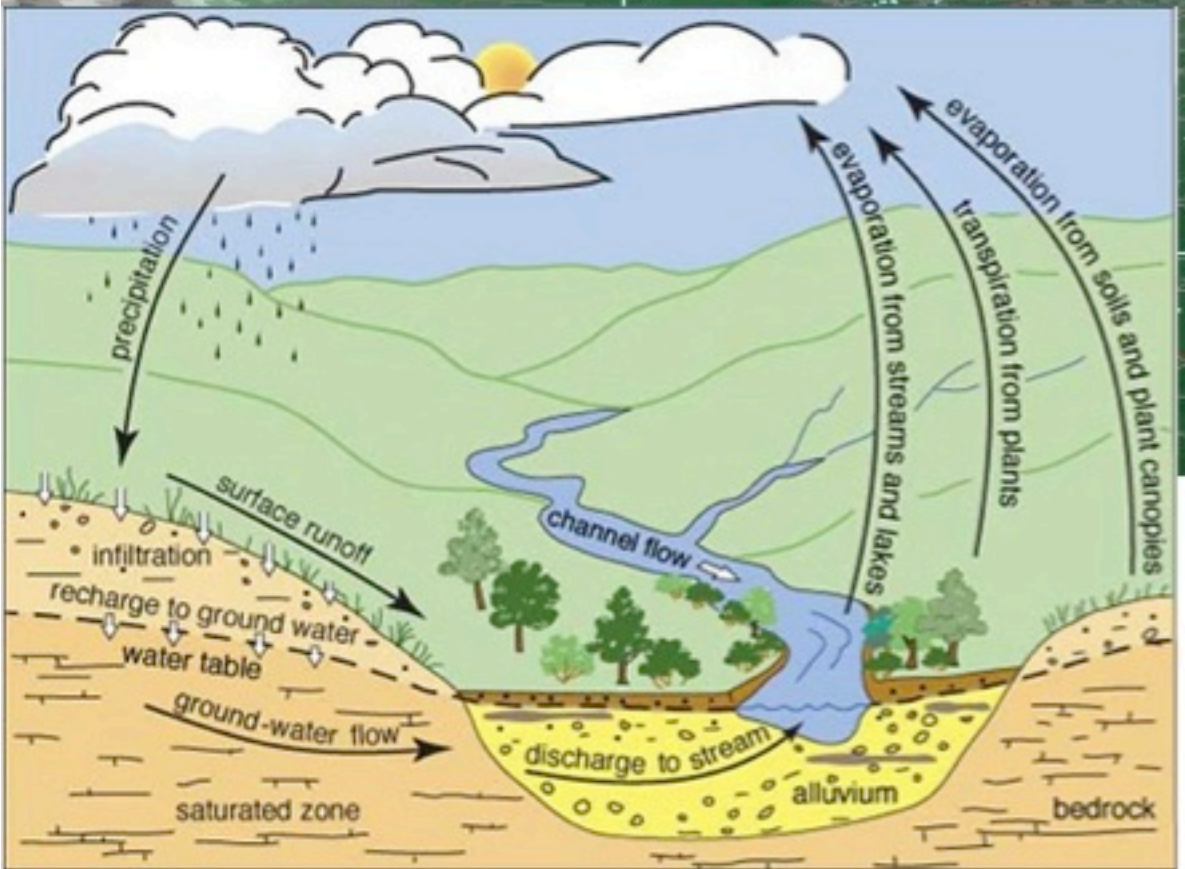
The red layer represents areas currently subject to shallow coastal flooding. A sea level rise of 3 feet is estimated to increase the number of days of flooding per year in these areas by a factor of 150.

Previous studies have explored risks of sea level rise-our goal was to address upland impacts of climate change to integrate into this picture

Basin Characterization Model

Flint and Flint USGS

To get at important issue of available water for people and ecosystems!

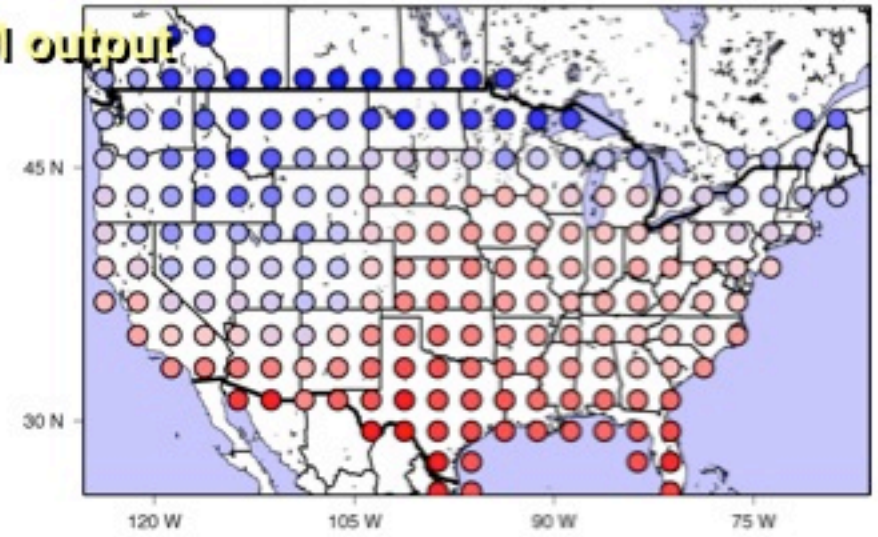


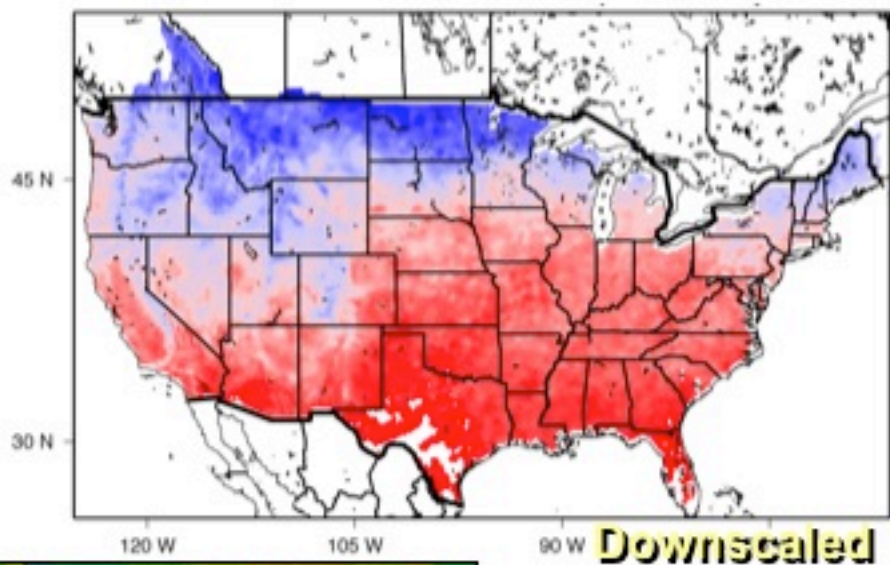
Solves the physical water and energy balance based on topography, soils, rainfall, and temp for every pixel in domain—to estimate flows, recharge and soil moisture

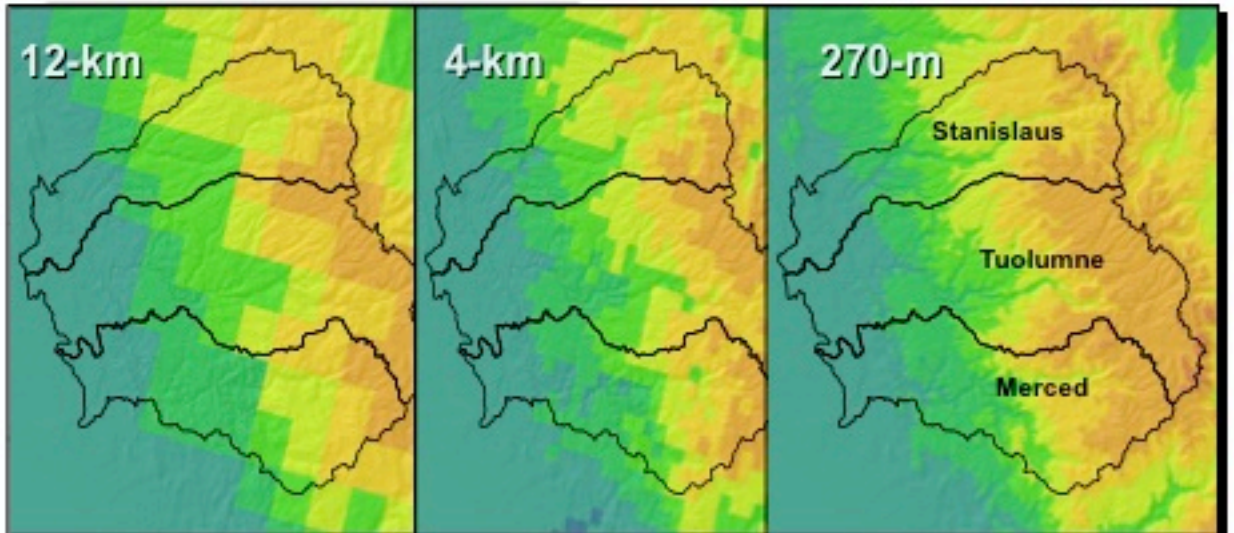
TBC3 downscaled climate-hydro scenarios (not predictions!)

- Global Models: from 275-km to 12-km to 4-km to 270m, climate and hydro

Hidalgo et al. (2007)

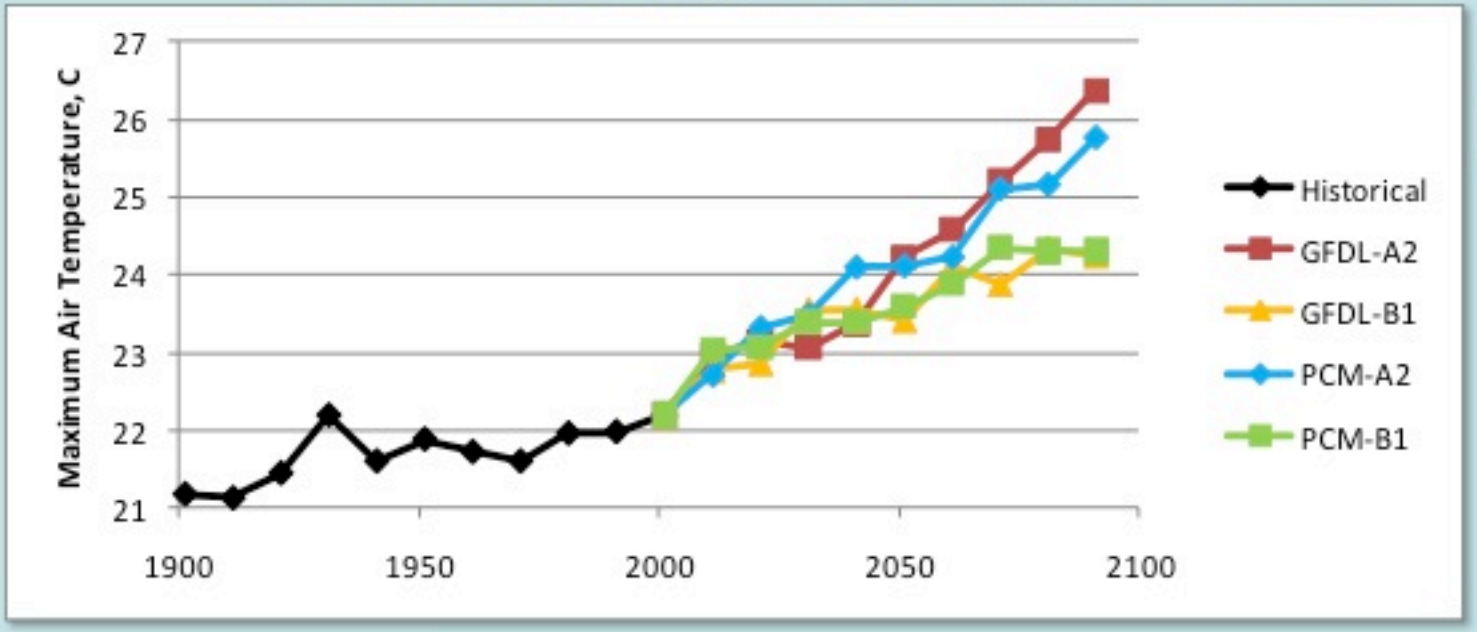






Lorraine and Alan Flint, USGS Water Resources Center

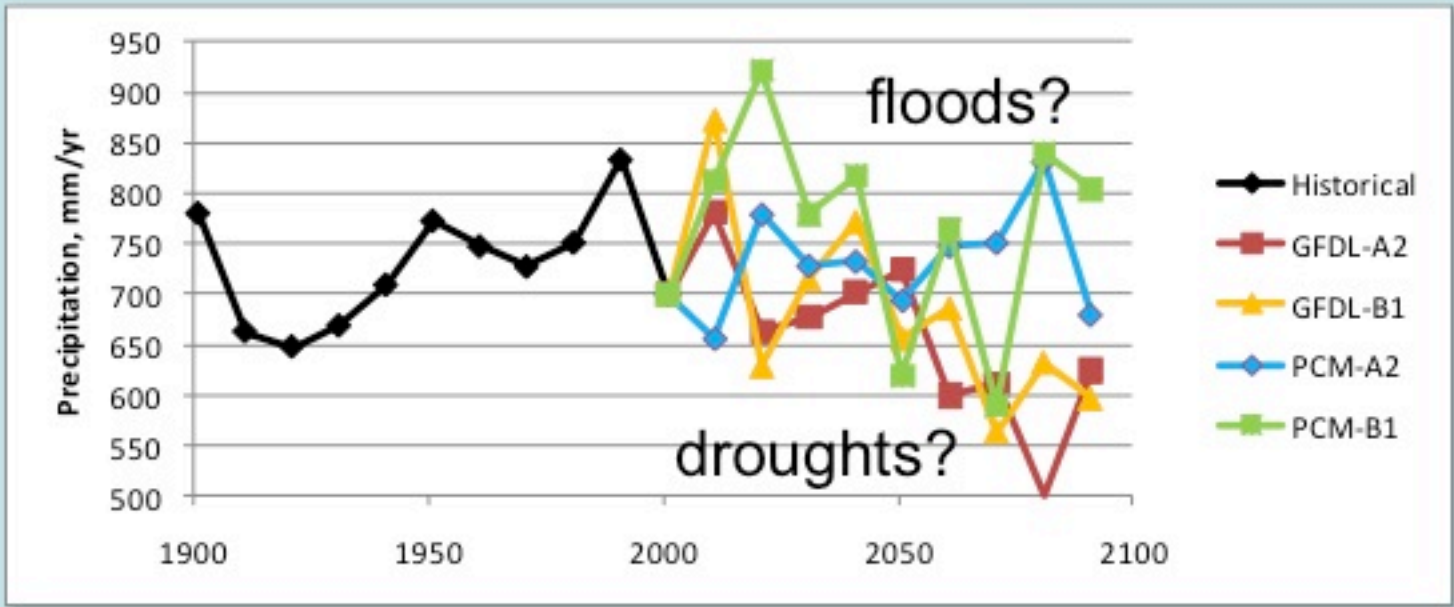
Downscaled climate for Sonoma County: current and future conditions – 4 scenarios

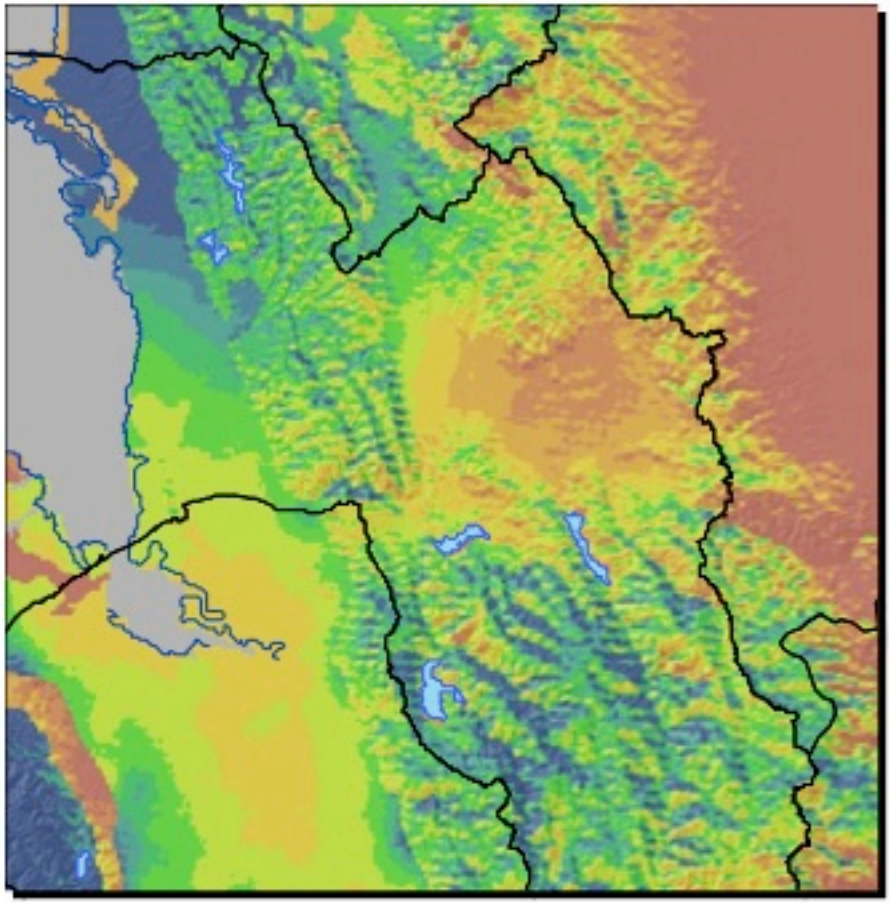


+1.5 ° F since 1900

+8 ° F by end of century?

Much higher uncertainty about future rainfall than temperatures!

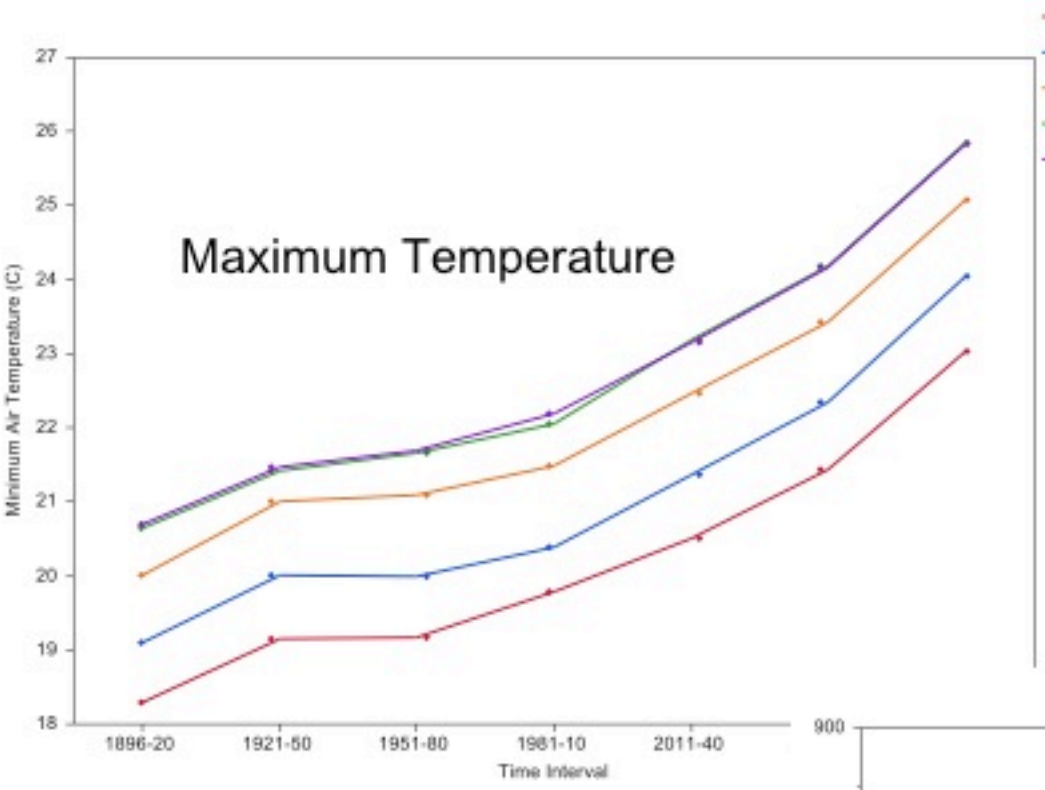




Climatic Water Deficit in South Bay

Google Earth Image of South Bay

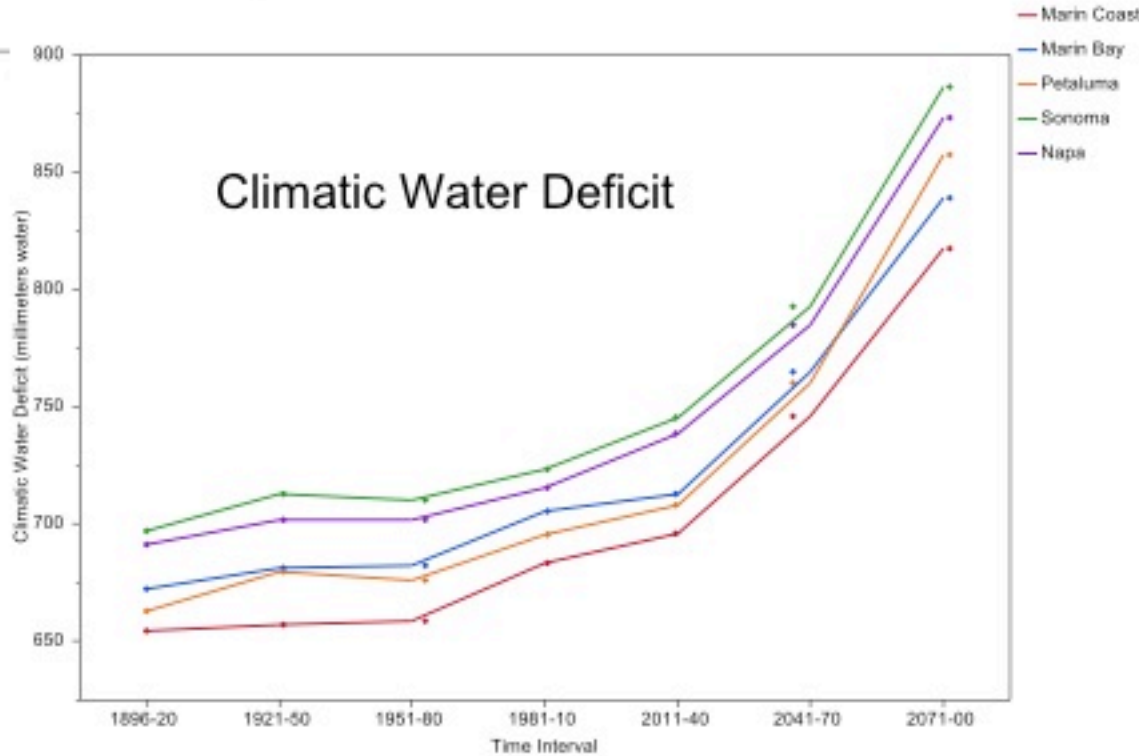
soil water deficit correlates to vegetation cover-this late summer deficit is projected to increase even with higher winter rainfall



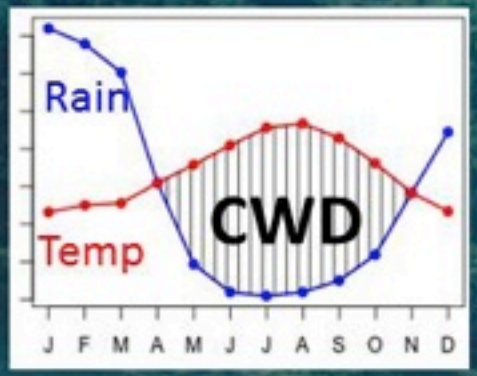
Major Basin Comparisons:

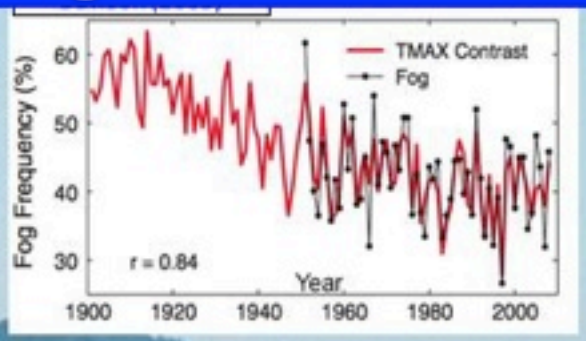
Water Deficit increase steeper than Temp

Under both warmer drier and warmer wetter scenarios, climatic water deficit increases on the order of 10-20%, additional water needed to maintain vegetation cover (natural or crop)



Penetrating the mysteries of fog…..





Maps of future climatic water deficit scenarios for CA suggest increasing late summer aridity under all scenarios, will fog mitigate this effect, if so, how much and where?

Data suggest Pacific coastal fog is in decline. Is this related to climate change? How will it affect coastal species and habitats?

USGS

SCRIPPS INSTITUTION OF OCEANOGRAPHY

DRI

LAND, AIR AND WATER RESOURCES

JISAO

BAY AREA | OPEN SPACE COUNCIL

Take home

The future is expected to be

warmer and drier

(in terms of late summer aridity)

regardless of whether the North Bay experiences more or less rain as a result of climate change

the uncertainty is about how fast these changes will occur and this is in our hands as a global community

in order to adapt locally we need to start measuring patterns of change now and pursue "no regrets" policies!


So what?

Implications for watershed management of conservation lands

change in vegetation cover to communities tolerant of more arid conditions (and more fire-prone?)

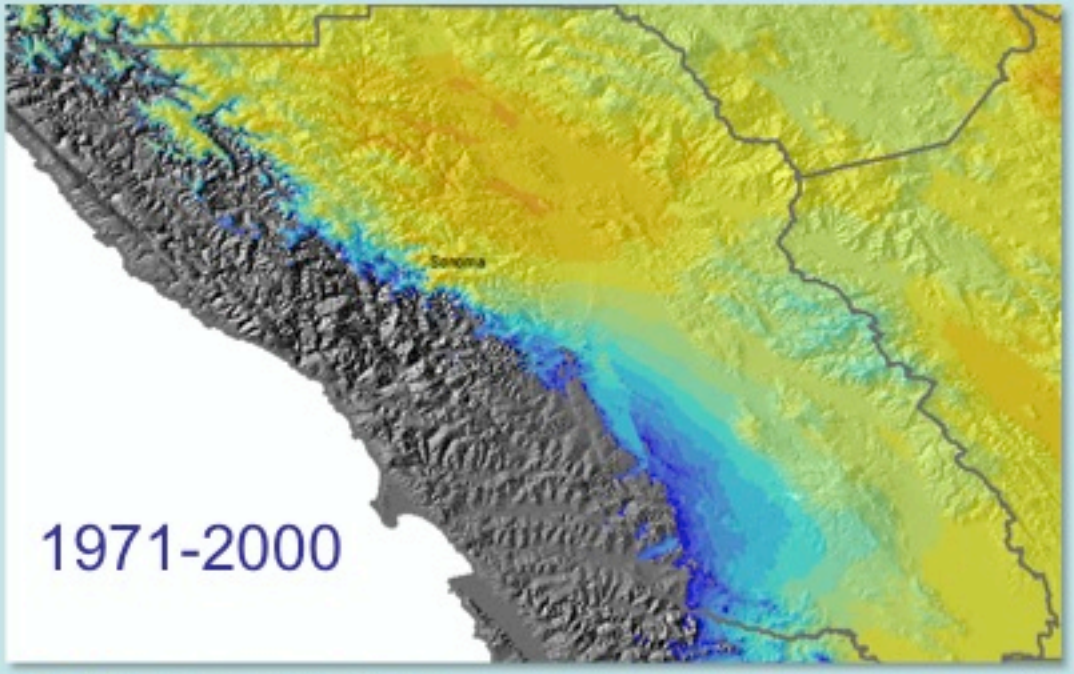
loss of habitats that require high soil moisture to support sensitive species. We can preserve the ball park, but the players are going to change!

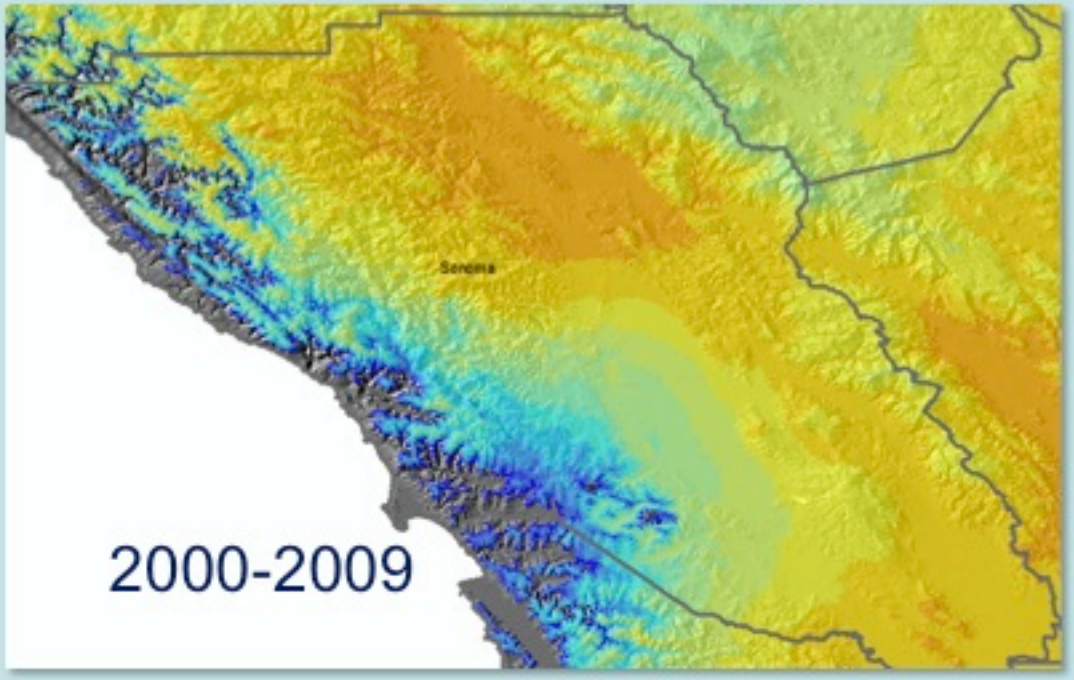
protected headwaters will grow more important for fisheries, flood control and groundwater recharge

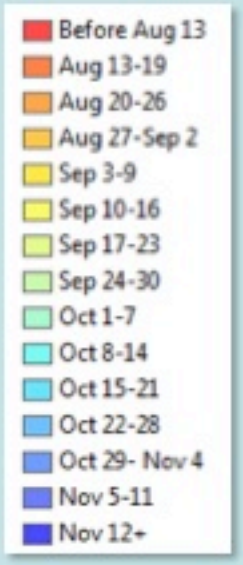
Mean Ripening Date

Group 5 1250 DD (Pinot Noir, Chardonnay)

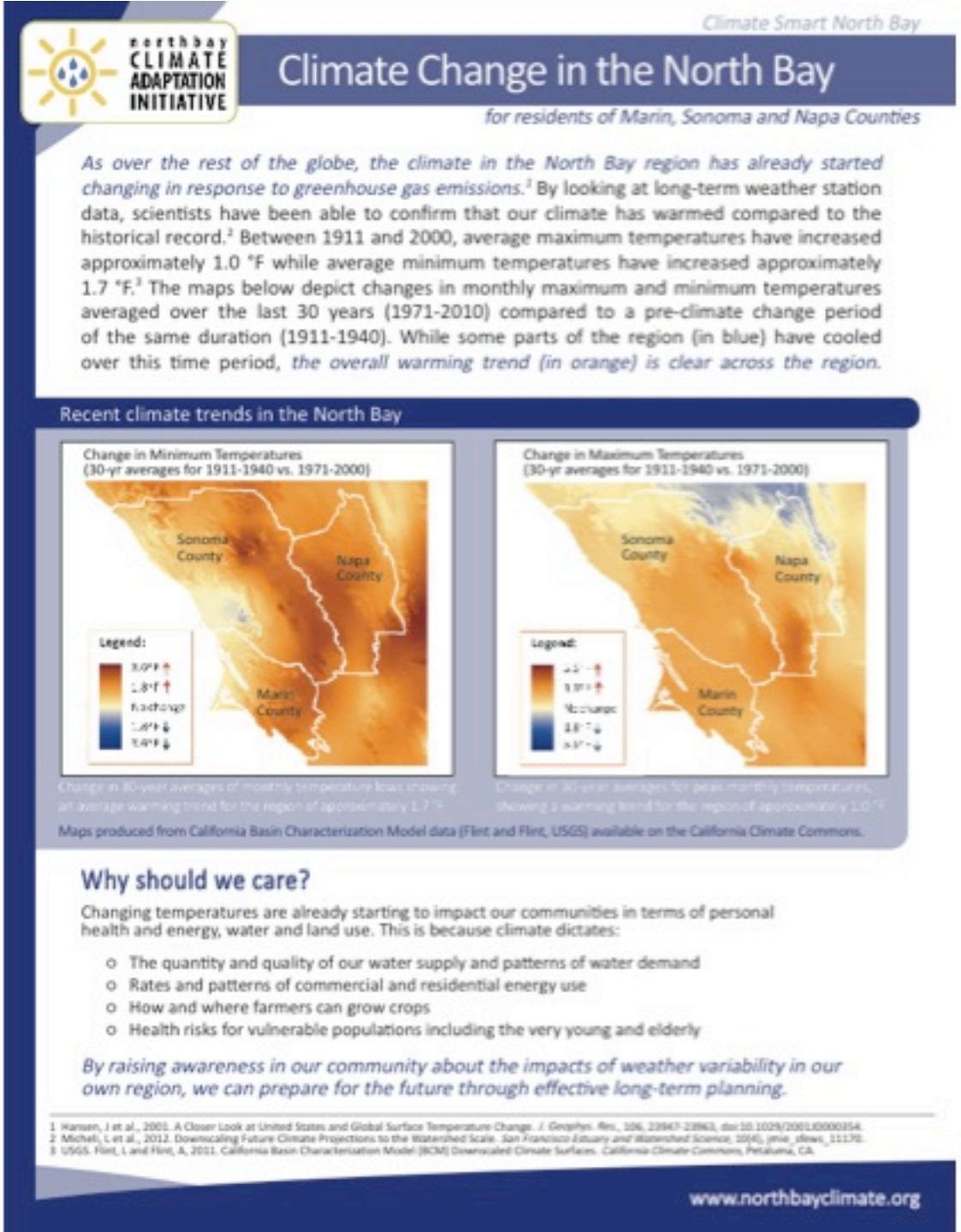
Prime grape growing regions are shifting locations







Flint, Flint and Weiss in prep

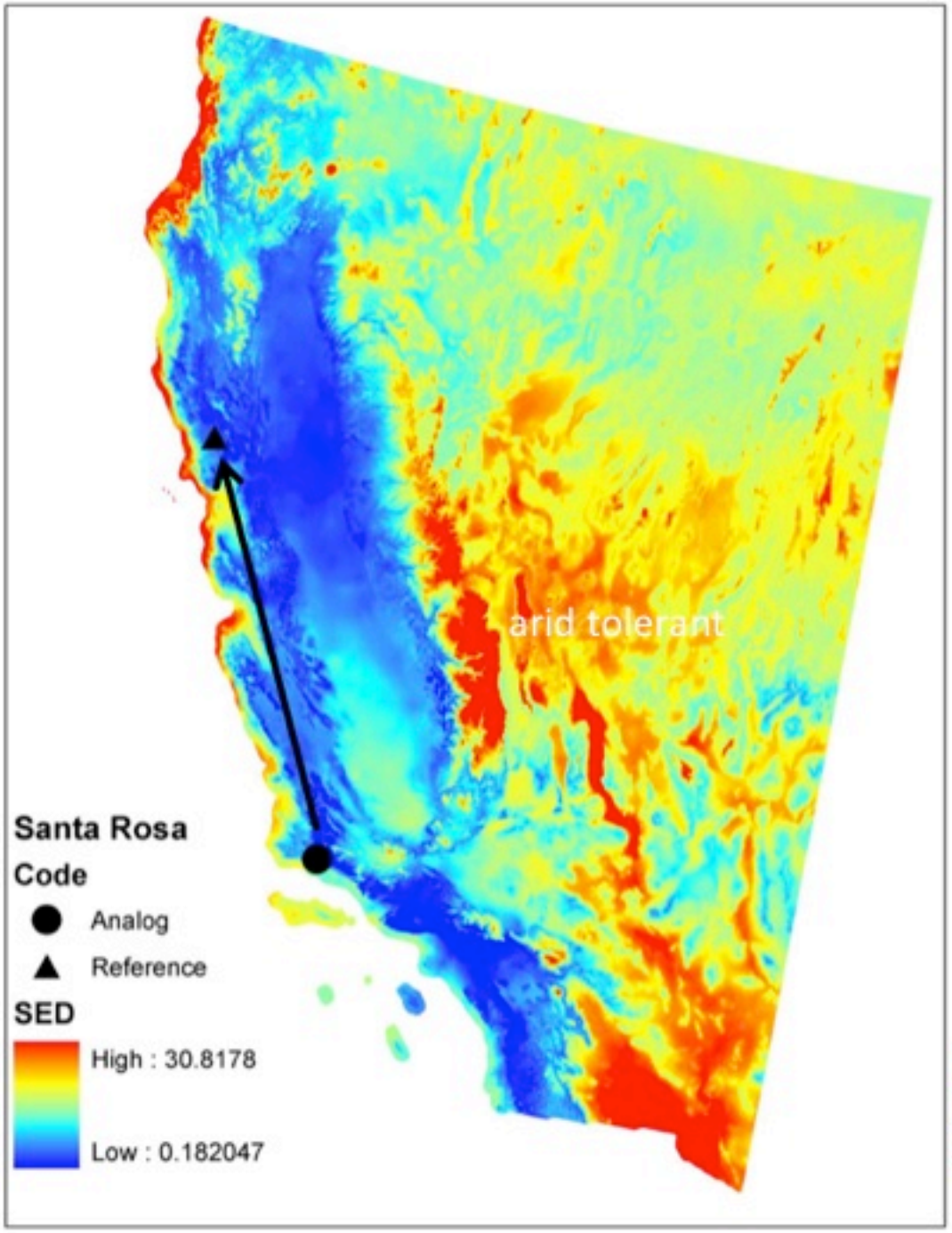


Outreach Goal

Raise awareness that climate change is underway and measurable

Fact Sheet Series-

1. Science summary of impacts
2. Planning and policy implications
3. Waterways
4. Forest stewardship



Outreach Goal

Make our vulnerabilities tangible

where in CA has the climate now we anticipate for Santa Rosa for 2100?

Inland Santa Barbara County?

Healthy ecosystems provide free "services" to human communities, including: water filtration, groundwater recharging, stormwater control, air purification, nutrient recycling, crop pollination, and soil enrichment.

Outreach Goal

Build an appreciation for ecosystem services

Including the potential to protect human communities against the harmful effects of climate change

What can we do to create climate resilient communities in the North Bay?

Identify and implement "no regrets" strategies, many already in play.

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"nowcasting"

coupling climate-ecosystem measurements

advancing real-time monitoring in So Co and across region

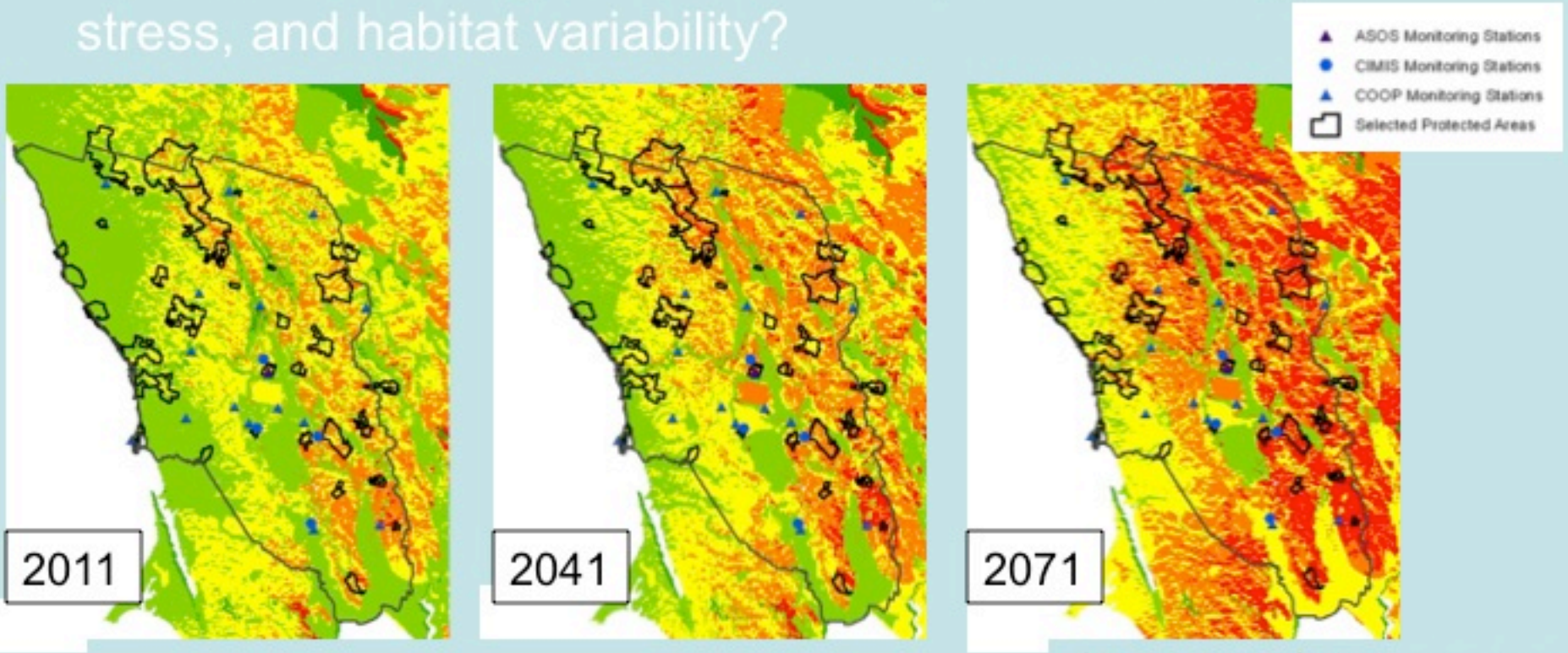
sharing data

creating a community of practitioners

disseminating lessons learned

we need cost-effective means of measuring climate in concert with biotic "vital signs

Where should we locate monitoring stations for a representative range of iso-climates, climate change stress, and habitat variability?

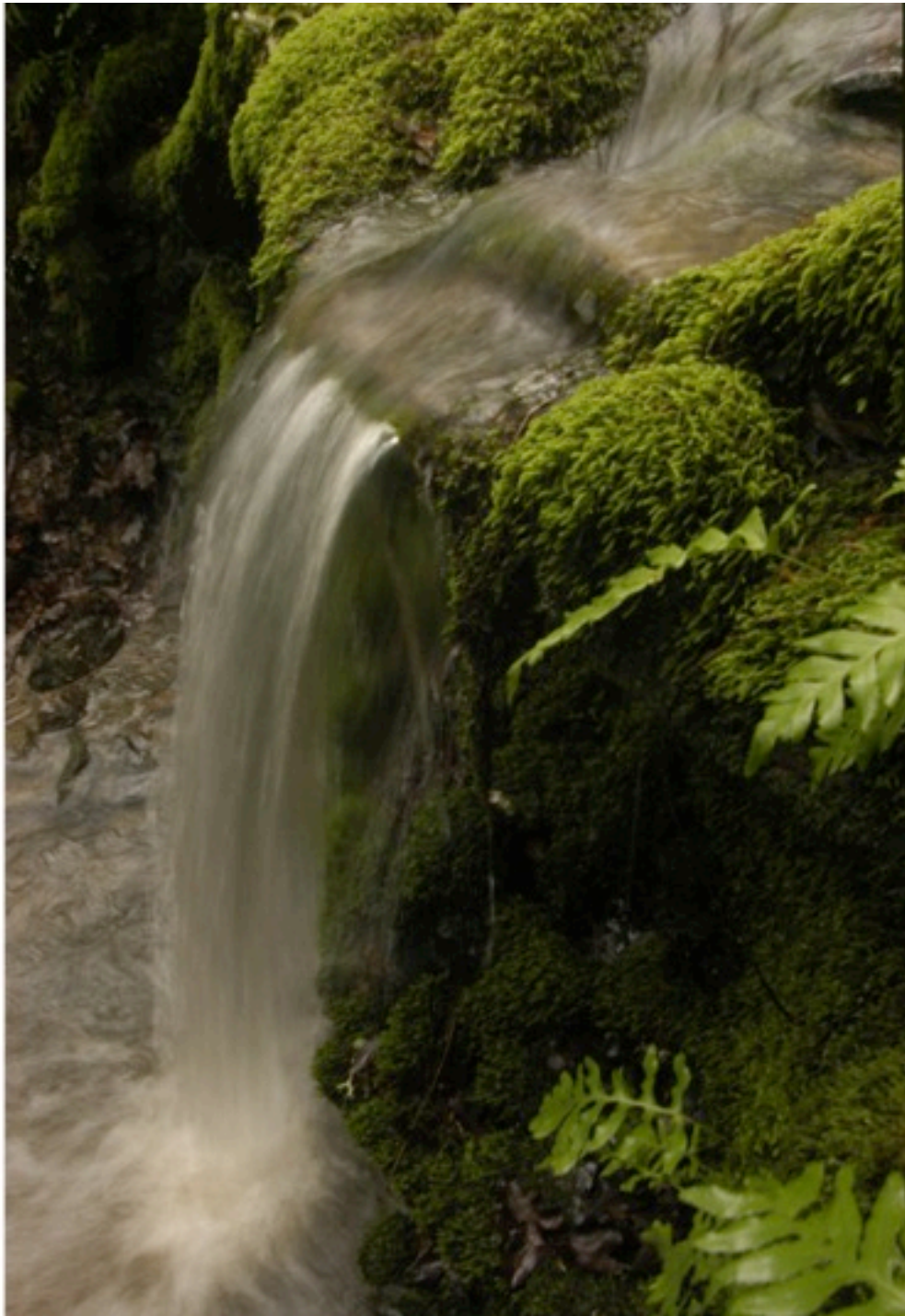


Climatic Water Deficit change over time

- Map the range of Sonoma County's current and future iso-climates and habitat variability
- Select representative preserves for potential monitoring sites
- Install weather, hydrology, and biological monitoring stations
- Important for flood and drought warnings!

Water

diversify supply portfolio * increase efficiency of all uses * pursue water catchment and reuse at all scales* increase distributed storage * enhance groundwater recharge and underground storage * buffer streams and floodplains * apply “green infrastructure” for flood control * restore marshes to protect from sea level rise

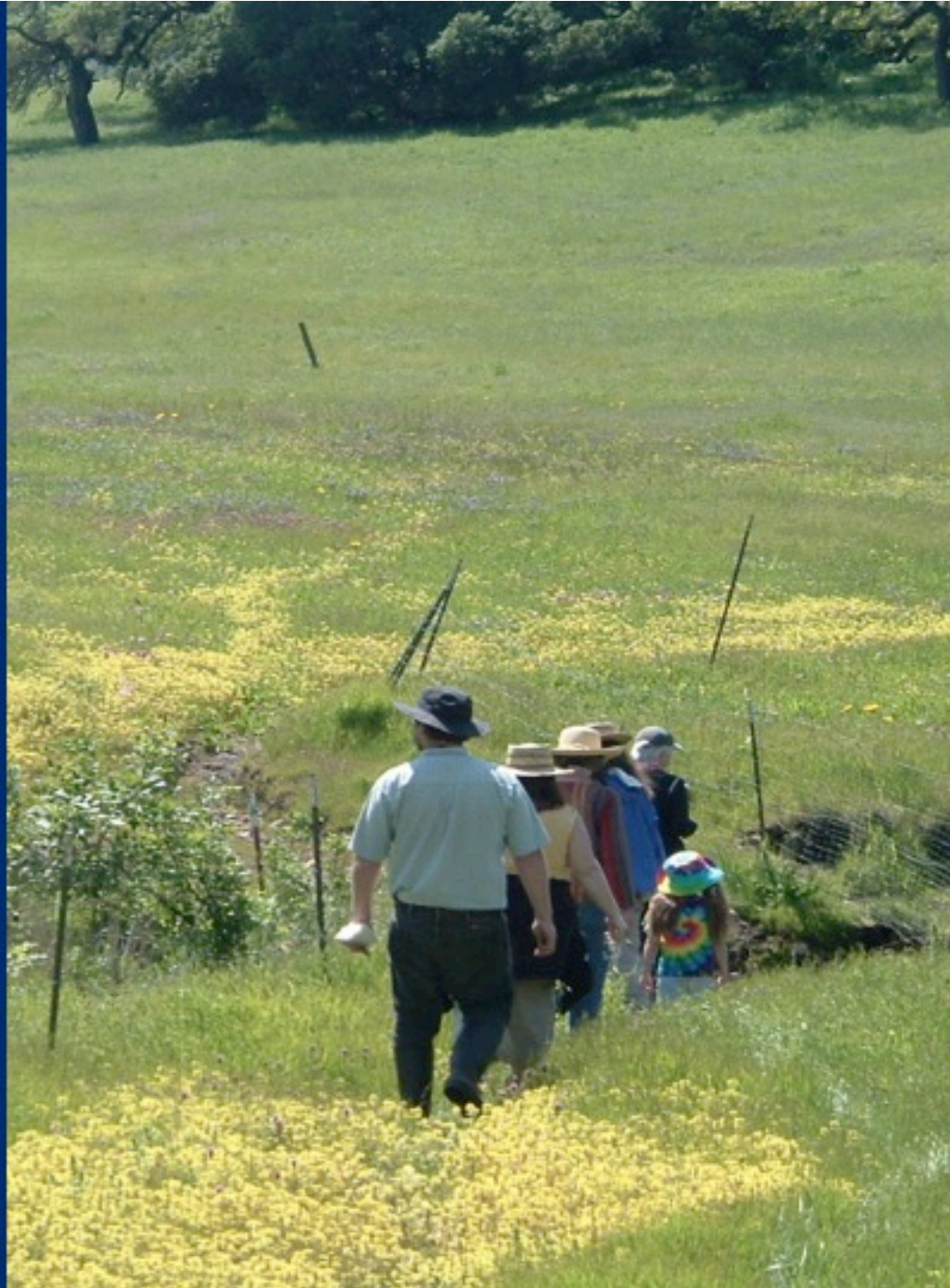


Agriculture

enhance water security* increase soil moisture holding capacity * plan crops to minimize “burn” risk * protect resilient farmlands * distribute food production * use high tech to time irrigation and frost protection * convert to crops tolerant of higher aridity * create shared “cooling centers” for produce storage and transport * track pests

Health

identify and train sensitive populations * prepare emergency heat centers * monitor disease vectors * add shade to exposed environments * raise bar for emergency response * be fire and flood ready * increase neighborhood capacity to respond to extreme events * provide planning guidelines for new developments *



OLUTIONS are in the hands of cal citizens and governments

en risks to water resources and biodiversity, tinued efforts to *mitigate* (reduce) greenhouse es are worth it!

unties and Cities need to develop and lement adaptive measures: coordinate long- m land, water, infrastructure planning and ergency response

ter conservation and catchment are more ortant than ever! Approaches to enhance soil isture holding capacity?

must monitor real-time climate change to ctively refine adaptation responses over time!

orthbayclimate.org

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thank you!






lmicheli@pepperwoodpreserve.org